IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	REZNEK et al.	Examiner:	Lyle Alexander
Application Number:	10/649,347	Group Art Unit:	1797
Filed:	August 27, 2003	Confirmation No.:	4170
Docket No.:	CBK03072 (3600-374-22)		

For: METHODS OF PROVIDING PRODUCT CONSISTENCY

DECLARATION UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, the undersigned declarant, Sheldon B. Davis do hereby declare and state:

1. I am not a named co-inventor of the invention described and claimed in the above-identified patent application.

2. I am familiar with the subject matter, contents, and relevant portions of the prosecution history of the above-identified application including the Office Action dated February 26, 2009, and the references discussed therein, including U.S. Patent Number. 6,800,413 B2 to Barthel et al. ("Barthel et al.") and U.S. Patent Number 6,348,539 B1 to Wideman et al. ("Wideman et al.").[1]

3. I received a Bachelor of Science degree in chemical engineering in 1995 from North Carolina State University and my doctoral degree in chemical engineering in 1999 from the University of Arizona. I am a member of the American Association of Aerosol Research and the

[1] I have been informed by one of Cabot Corporation's patent attorneys of record in this patent application that the "Okado et al." reference mentioned in the Office Action of 2/26/2009 can be disregarded, based on clarifications received from the Examiner by telephone since the Office Action.

AiChE, as well as a member of the advisory committees for the Chemical Engineering Department at Northeastern University and Arizona State University. I am an author or co-author on numerous technical publications pertaining to chemical engineering, especially combustion processes.

4. After completing post-doctoral research at the University of Arizona, I held the position of Research Engineer, Applied Research and Development, at Praxair Incorporated (Tarrytown, NY). In 2001, I joined Cabot Corporation, where I have held several positions over the intervening years: Research Engineer, Rubber Blacks Division (2001-2002), Senior Research Engineer, Rubber Blacks Division (2003-2004), Research Project Leader, Fumed Metal Oxides Division (2005-2007), Manager, Process Group, Fumed Metal Oxides Division (2007), and Manager, Process Research and Development, Performance Segment (2008-present). I have over 15 total years experience in various capacities relating to research, development, and production of particulate materials in general and carbon black products in particular.

5. In view of at least the facts set forth above and referenced in paragraphs 1 - 4 above, inclusive of my indicated combined educational and industry experience, I believe that I should be considered an expert in the field of particulate material technology, including but not limited to carbon black and silica technologies.

6. My understanding of the present invention is based on at least the following factual information and my observations thereon. As explained in the present application, the present invention relates to resolving a problem associated with carbon black and silica particulate material production in which particulate materials that seemingly were made "within spec" with respect to one or more measures of morphology, such as particles size, surface area, structure, porosity, etc., do not perform consistently as expected in end-use or intermediate-use

applications of the particulate material. Prior to the present invention, the industry was perplexed about why this was happening. Trying to resolve the problem at the customer level is problematic. Ideally, the carbon black or silica particulate material that leaves the production plant will perform as specified, and non-compliant materials would be identified and resolved before a product reaches customers. In this context, the present inventors discovered that such particulate materials can be evaluated in terms of a different modality of measurement - an interfacial property value measurement - which can be used to more reliably reveal whether particulate material is actually within spec or not for an application. If determined to be necessary from the interfacial property value measurement, adjustments can be made in the production of the material to maintain the interfacial potential property value of the particulate material within a target range. As defined in the present application, the interfacial potential of a particulate material is defined through a measure of a physical phenomenon that depends on the interaction of particulate material with other materials or with itself, after the effects of morphology have been removed (e.g., application paragraph [0024]). As also explained in the present application, when two particles are in contact with each other the interfacial potential is the cohesion per unit area of contact, and, when particulate material is mixed into a fluid, the interfacial potential is the adhesion per unit area of the particle. If the measurement is per unit mass then the total interaction depends on the surface area per unit mass and the interfacial potential per unit area. The interfacial potential property value may be any property that can be correlated to the interfacial potential of the particulate material. I note that examples of the present application demonstrate that morphological values can appear to indicate that particulate materials are within spec, while the added interfacial potential property measurements serve to reveal which of those particulates will perform inconsistently when applied. Based on this information provided in the present application, my opinion is that a person skilled in the art

would not equate or confuse an interfacial potential property value with a conventional morphological value.

7. As a result of the discovery of the present inventors, my view is that the present invention can provide quality control and/or quality assurance for the particulate material before it reaches end-product or intermediate produce users, which can make it easier for a customer to obtain consistency in their end products and any intermediate products containing the particulate material, such as polymer products, elastomeric products, inks, coatings, toners, and the like. The claims of the application, such as set forth in the Amendment filed on December 12, 2008 by the applicants, reflect these and other features of the present invention. Present claim 1 of the above-identified application, for example, recites a method of providing product consistency for a particulate material comprising the steps of: a) maintaining at least one morphological value of a particulate material within a first target range and b) maintaining at least one interfacial potential property value of the particulate material within a second target range, comprising: i) determining at least one interfacial property value of the particulate material; and ii) adjusting at least one process variable of a process for producing the particulate material, wherein the adjustment maintains the interfacial potential property value within the second target range, wherein said particulate material is a carbon black or silica. Several approaches to practicing the general concept of claim 1 are also claimed in the present application. For example, claim 24, recites, in part, that the interfacial potential property value is determined by a wicking rate method comprising determining a difference in wicking rate for two or more liquids into equivalent packed columns of the particulate material. Other methods are also recited in other claims, such as an interfacial potential absorptometry method as recited in claim 21, a yield point method recited in claim 25, and interfacial potential vapor adsorption method recited in claim 26.

8. Despite the above-identified technical breakthrough of the present inventors, I understand that the Examiner has made an obviousness rejection of claims 1-3, 7-13, 15-19, and 21-27 of the present application under 35 U.S.C. § 103(a) based on each of the above-identified U.S. patent references to Barthel et al. and Wideman et al. in his most recent Office Action dated February 26, 2009. In making this rejection, the Examiner states that Wideman et al. teaches "a method of making a composition comprising carbon black, silica and metal oxide particles in specific size ranges ... [t]orque and BET values monitored to determine the desired characteristics of the composition and have been read on the claimed combination of '*morphological values*' and '*interfacial potential properties*'" (Office Action of 2/26/2009, page 2). The Examiner further states that "the instant claim language is sufficiently broad and not specific to the state of matter of the particles and has been properly read on the polymerized particles taught by Wilderman et al. [*sic*]" (Office Action of 2/26/2009, page 5). The Examiner states that Barthel et al. teaches "a method of preparing carbon black and silica at the specific BET - method surface area (DIN 66131 and 66132) where these characteristics are determined by gas adsorption or inverse gas chromatography ... [t]he taught 'BET' has been read on the claimed combination of '*morphological values*' and '*interfacial potential properties*'" (Office Action of 2/26/2009, page 3). The Examiner also is understood to urge that "the Office maintains the taught BET is indistinguishable" from measurements of interfacial properties as described in paragraph [0043] of the specification, and that "the specific limitations of paragraph [043] [*sic*] are presently not claimed" (Office Action of 2/26/2009, page 5). In making these rejections, the Examiner also states that "Barthel et al. and Wideman et al. are silent to the claimed ranges of the morphological values within about 10%, the interfacial potential property value within about 50% and adjusting the process variables to achieve the desired properties ... [i]t would have been within the skill of the art to further modify ... Barthel et al. or Wideman et

al. and adjust at least one process variable to achieve the desired result" (Office Action of 2/26/2009, pages 3-4). With respect to testing by "wicking rate," the Examiner states "[t]esting a particulate material by the speed or distance the particulate solution 'wicks' is notoriously well known in the art (e.g. for example [*sic*] paper chromatography)" (Office Action of 2/26/2009, page 4), and "the Office maintains the claims are sufficiently broad to have been equated to chromatography wicking" (Office Action of 2/26/2009, page 6).

9. With respect to the Barthel et al. reference, based on my review I observe that Barthel et al. relates to low-silanol silicas that are designed for various uses including emphasis placed on their use in developers and toners, e.g., magnetic and nonmagnetic toners, used for printing/reproduction and image transfer processes (e.g., col. 11, line 43 to col. 12, line 29). I observe that the Barthel et al. reference indicates that the silica is used as an additive to prevent caking, clumping, or reagglomeration and keep powders flowable, as a rheological additive, and as a reinforcing filler (col. 11, lines 29-42, col. 11, line 64 to col. 12, line 11). In this respect, my opinion is that Barthel et al. is describing purposes for the silica that merely relate to physical or morphological properties of the product, such as toners. Based on my experience with carbon blacks and other particulate materials designed and used for print developers and toners, those materials have not been conventionally designed using concepts of an "interfacial potential" of the particles (as that terminology is defined in the present application), nor has any connection previously been made in the toner arts between interfacial property and quality control for end-product performance. Based on my review, Barthel et al. does not teach or suggest that interfacial potential (as defined in the present application) of silica or carbon black is a results-effective parameter for those materials that achieves a recognized result. I also observe that Barthel et al. fails to appreciate the importance of maintaining at least one interfacial potential property value of a particulate additive within a target range, in addition to maintaining at least

morphological value of the additive within a target range, in order to avoid the problem of a particulate additive that appears to be within spec, but a product incorporating the additive does not perform as expected or predicted. As I have noted above, the examples of the present application demonstrate that morphological values can appear to indicate that particulate materials are within spec, while the added interfacial potential property measurements can uncover which of those will perform inconsistently when used in an application. I do not see where Barthel et al. teaches or suggests this discovery expressly or by accident.

10. Based on my experience with BET analysis as conventionally used in the particulate material industry, I explain that it is well known in the particulate material industry that the measurement of gas adsorption by the DIN standards 66131 and 66132 as described and used in Barthel et al. involves measuring the adsorption of nitrogen or krypton as an inert gas for purposes of the measurement. My opinion is that these conventional standards for BET analysis used by Barthel et al. provide only a measurement of surface area as a morphological property of the tested material. Surface area measurements, such as conventional BET analysis conducted using an inert gas such as nitrogen or krypton, are routinely used in the industry as estimates of average particle size. Based on my knowledge and experience in this art, such conventional BET analysis used in Barthel et al. has not been used by researchers or technicians in the field to measure "interfacial potential" of particles as that terminology is defined in the present application (e.g., paragraph [0024]), nor would it inherently provide such information. Also based on my review, I note that paragraph [0043] of the present application explains that alternative gases, such as water, ammonia, and various organic vapors such as toluene and ethanol, to the common "inert gases," can be used for BET analysis for determining interfacial potential according to methods of the present invention. Based on my review, Barthel et al. does not describe use of any of these alternative gases for BET analysis by the DIN standards 66131 and 66132. In view of these facts, my technical opinion is that

Barthel et al. uses a different BET test for a different purpose than the present invention. It also is my opinion that Barthel et al. does not teach or suggest how a standard BET analysis according to DIN 66131 and 66132 may be modified to provide a measure of interfacial potential as recited in the present claims, nor that such a modification, such as substituting one of the above-mentioned "alternative gases" for a BET analysis as described in the present application for the conventionally used gases for BET analysis, would be expected to yield a predictable result from a technical standpoint.

11. With respect to the Wideman et al. reference, I observe that Wideman et al. relates to use of silica as a filler for tire tread rubber. I also observe that Wideman et al. measures surface area of the silica using a conventional BET method, as measured using nitrogen gas, as a morphological property measurement (e.g., col. 4, lines 41-47). I refer to and incorporate my foregoing remarks on why conventional BET analysis, such as also used by Wideman et al., will not provide a measure of interfacial potential as defined in the present application. Further, torque is measured by Wideman et al. on a compounded rubber sample and not the particulate material itself (col. 8, line 55 to col. 9, line 4). I observe that implementation of quality control at the filled product (compounded rubber) level, such as in Wideman et al., overlooks the potential serious problem of particulates made "within spec" which nonetheless perform inconsistently in applications. Wideman et al., like Barthel et al., fails to appreciate the importance of maintaining at least one interfacial potential property value of a filler within a target range, in addition to maintaining at least morphological value of the filler within a target range, in order to avoid the problem of a filler that appears to be within spec but the product incorporating the filler does not perform as expected or predicted. I do not see where Wideman et al. teaches or suggests this discovery expressly or by accident.

12. With respect to the Examiner's above-noted assertion made in the most recent Office Action that the claims of the present application are sufficiently broad to have been equated to chromatography wicking, my technical opinion is that the Examiner's conclusion in this respect is not supported by facts and is flawed for at least the following reasons. I note that claim 24, for example, of the present application recites a wicking rate method used as a measure of the interfacial potential of the particulate material that is carbon black or silica, wherein the interfacial potential property value is determined by a wicking rate method "comprising determining a difference in wicking rate for two or more liquids into equivalent packed columns of the particulate material". Example 4 (paragraphs [0069]-[0070]) in the present application illustrates this embodiment. Based on my knowledge of both packed column chromatography and paper chromatography, I point out that any measurement of wicks in paper chromatography does not correspond to measurement of interfacial potential by wicking rates such as described and claimed in the present application. Paper chromatography, as well known in the chemical arts, is a method conventionally used to separate compounds from a mixture for identification. The separated substances on the chromatography paper form a color pattern called a chromatogram. As well known, each pigment or compound of the mixture being tested by a paper chromatography method will have a unique rate of migration (Rf) value that scientists can use to identify the substance. As such, paper chromatography is not a measurement of an interfacial potential property value as defined for the present application. Further, I observe that the Examiner has not set forth an apparent reason why one of ordinary skill in the art would have considered modifying any "notoriously well known" wicking tests to duplicate the method of present claim 1, or, particularly, the wicking rate method such as recited in present claim 24, where the interfacial potential property value of a carbon black or silica is determined by the method, not the identities of different compounds in a mixture.

13. In view of this evidence including my opinions, it is my opinion that one of ordinary skill in the art would not have found the invention of the present application, such as recited in any of claims 1-3, 7-13, 15-19, and 21-27, to be *prima facie* inherent to or obvious at the time of the invention in view of Barthel et al. or Wideman et al.

14. I also understand that the Examiner has rejected claims 21-23 and 25-26 of the present application under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement, in his Office Action of February 26, 2009. The Examiner is understood to state that the original specification does not describe the new amendments to claims 21, 25 and 26 as the Patent Office "did not find literal support" (Office Action of 2/26/2009, page 2). Based on my review of the original disclosures of the present application and the claims in question, it is my opinion that the disclosure of the present application conveys with reasonable clarity to persons skilled in the art of particulate material production that the present inventors, at the time of filing their application, had fully conceived and possessed the subject matter recited in claims 21, 25, and 26, and any claims depending from them, as recited in the applicants' response filed December 12, 2008. In particular, based on my review and expertise, it is my opinion that amended claim 21 recites the use of an interfacial potential absorptometry method, which in my opinion is described in a comprehensible and supported manner to a person skilled in the art in the present application as filed at, for example, paragraphs [0047], [0062], [0065], [0067], and [0074]. Also based on my review and expertise in the relevant art, it is my opinion that amended claim 25 recites the use of a yield point method, which a person of skill in the pertinent field would consider comprehensible and supported, for example, at paragraph [0049] in the present application as filed. Further, based on my review and expertise in the relevant art, it is my opinion that amended claim 26 recites the use of an interfacial potential vapor adsorption method, which a person skilled in the pertinent would consider comprehensible and supported, for example, at

paragraph [0043] in the present application as filed.

15. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the instant application or any patent issuing therefrom.

26 August 2009
Date

Sheldon B. Davis